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ABSTRACT

This survey was conducted to examine differences and similarities between teachers', principals', and college professors' views as reflected on an inventory concerned with both cognitive and affective outcomes of mathematics instruction. A total of 222 randomly selected secondary principals each selected (randomly) one mathematics teacher from their faculty, then both the principals and the teachers completed a 30-item Mathematics Inventory for Teachers (MIT). One hundred forty-one university mathematics educators also took the MIT. Scores were compared using multivariate analysis of variance procedures. Results showed that the mathematics educators did not conceptualize issues in the same manner as school personnel. Principals and teachers tended to be more closely aligned and expressed a greater amount of ideological agreement than teachers and mathematics educators. (DT)

Reporting Session

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Differences Between Teachers' Self-Ratings and Principal and University Faculty's Idealized Mathematics Teacher as Measured by a Mathematics Inventory

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ABSTRACT

This survey was conducted to examine differences and similarities between teachers', principals', and college professors' views as reflected on an inventory concerned with both cognitive and affective outcomes of mathematics instruction. Scores were compared using multivariate analysis of variance procedures.

Sampling Procedures

The Minnesota Research and Evaluation Project, was funded to study the process of educational change and evaluate a number of NSF supported projects in selected regions of the country. As part of its total effort, in 1972, 222 secondary level principals in California, Michigan, and Indiana were randomly selected to participate in a data gathering procedure. Each principal was asked to randomly select one teacher from the mathematics faculty of their school. Both teachers and principals subsequently completed a battery of instruments, among these the 30-item Mathematics Inventory for Teachers (MIT). The MIT assembled by Bracht (1972) contains statements concerning educational ideas and practices specifically dealing with the teaching and learning of methematics in the secondary school. The items assess attitudes toward mathematics and its teaching. Teachers were asked to express their own beliefs and opinions, principals were asked to respond to the MIT as they <u>believed</u> an <u>ideal</u> mathematics teacher would.

University level participants in this study were selected from the mailing list of the Bulletin for Leaders from the National Council of Teachers of Mathematics. Forty-eight states (Alaska and Hawaii excluded) were stratified into six geographic regions. Participants' names were randomly selected from each region. A total of two hundred names were generated using this procedure. One hundred forty one responded.

University level participants were asked to respond to the MIT "as you would expect an ideal mathematics teacher to answer the items," the same directions as were given principals.

A Precursor to the Present Study:

Post, Ward and Willson (1974) used factor analytic techniques to sort the 30 MIT items into eight factors and calculate factor scores for both principal and teacher in 148 randomly selected cases (principal-teacher pairs) (P-T). The vectors of principal-teacher factor score differences ($\overrightarrow{P-T}$'s) on seven Identifiable factors* were tested via multivariate analysis of variance procedures against the hypothesis of no differences between a principal and his teacher ($H_o: \overrightarrow{P-T} = \vec{0}$). The principal-teacher difference on two factors, "Teacher Concern for Student" and "Higher Order Concern" showed different from 0 at $P < .01$ and .07 respectively. Principal-teacher differences were not detected on the other factors. The weightings used in determining factor scores were derived from the factor analysis of teacher's responses only. A totally independent factoring of principal's responses, however, yielded an essentially identical factor structure. This noteworthy stability would indicate that principals and teachers conceptualize the issues implied by the MIT in fundamentally the same manner.

Statistical Analysis and Discussion:

It was originally anticipated that an analysis parallel to the above would be performed in the present study. However, when factor analysis was performed on the MIT item data generated by college and university mathematics educators,

*These factors were labeled: (1) Flexibility, (2), Mathematics as Process, (3), Teacher Concern for Student, (4), Vocational Satisfaction, (5), Non-Rigid Practices, (6) Attitude Toward Teaching, and (7) Higher Order Concerns. (Factor 8 was not discernible.)

difficulties arose. The resulting factor structure was not only seemingly unidentifiable, it did not at all correspond to the structure generated in the earlier study referred to above. Such differences imply that college and university mathematics educators do not conceptualize mathematics education issues (at least those identified as factors in the earlier study) in the same manner as school personnel. Such differences raise the possibility that these groups are fundamentally different, each ascribing to ideas, procedures, and beliefs which are not only diverse but, also, perhaps misunderstood to one another. If substantiated by further research these differences would inhibit the rapidity with which educational innovations are implemented in the school setting and would further help to explain why many of the types of methodological and ideological changes normally suggested by university level mathematics educators are not realized at the classroom level.

The question was raised as to whether university level elementary, and, university level secondary mathematics course instructors differed in their responses to the MIT in the multivariate sense. If so, specific areas of discrepancy would be pinpointed using univariate F procedures. Two such analyses were performed. (1) Contrasting those persons who identified themselves as elementary methods only and secondary methods only, and (2) Contrasting those persons who identified themselves as solely elementary methods instructors and those who indicated responsibility for both elementary and secondary methods courses. In each case, a 30 dependent variable multivariate analysis of variance was conducted. Thirty univariate analyses were concurrently performed to suggest which MIT items contributed most to such multivariate differences as might be found.

An analysis (1), (Elementary methods only, contrasted with secondary methods only) the F-ratio for the multivariate test of equality of mean

vectors (30 dependent variables = individual MIT items) = 1.2028, df = (30, 35), P < .30.

In analysis (2) (Elementary methods, only, contrasted with elementary and secondary methods) the F-ratio for the multivariate test of equality of mean vectors (30 dependent variables = individual MIT items) = 1.1190, df = (30, 56), p < .35.

It was concluded from these two multivariate analyses that both elementary and secondary methods persons responded to the MIT in essentially the same manner. It is therefore reasonable to combine data from elementary and secondary level methods persons in subsequent contrasts with principals and/or teachers to increase the power of the analysis.

In contemplating the contrasts of university educators to teachers to principals, a potentially major design problem arose. The university educators were obviously an independent group; however, it was equally obvious that the teachers and principals should be treated as matched pairs. The problem could be circumvented if the principals and teachers could be treated as if they were independent samples, a treatment justified if the groups could be shown to be statistically independent.

It was concluded that such statistical dependence as did exist was slight and that treating the principals and teachers as independent groups was justified. The price of such a decision is to make certain parts of the following analysis tend toward the conservative.

When university persons were subsequently contrasted with teachers, significant differences occurred on 18 of 30 MIT Items (at $p < .05$). When principals and teachers were contrasted, significant differences occurred on only 10 of 30 MIT Items. These data imply that principals and teachers tend to be more closely aligned and express a greater amount of ideological agreement than

teachers and university mathematics educators, at least with respect to their patterns of responses to the MIT Items.

The relatively large scale discrepancies obtained suggest inherent or learned differences between groups. The magnitude of differences decreases as one proceeds from overall group comparisons to university instructor-teacher comparisons, to principal-teacher comparisons.

Teachers seem to be more ideologically compatable with their respective principals than with university level mathematics methods instructors. This is especially noteworthy since the MIT Scale was concerned exclusively with the teaching and learning of mathematics, and it is unlikely that a large portion of principals have been exposed recently to contemporary ideas regarding the teaching and learning of mathematics, at least as those ideas are espoused by university level mathematics educators. Why would mathematics teachers be less inclined to relate ideologically to those ideas espoused by "experts" in the field of mathematics teaching than to those of their school principal whose general lack of expertise in the field is both known and accepted? At least three possible non-competing explanations can be discussed.

1) By virtue of working within a larger organization, in this case the school, constraints are placed on an individual teachers' decision making power. This phenomenon tends to result in an apparent within-school conformity of thought and idea. 2) This study implies that contemporary programs in mathematics education at the college and university level have a decidedly cognitive bend. (This conclusion from data not discussed in this abstract) In possible contrast are currently used objective based mathematics programs which appear to be more behaviorally oriented. It appears that the degree of transfer from formal professional education to actual classroom implementation may thus be minimal. Whether the ideas and practices espoused in formal mathematics

courses are considerd simply idealistic, non-functional, or impractical is not clear at this time, but what does seem to be evident is the existence of fundamental differences in the conceptual framework within which teachers, principals and university level mathematics educators approach the teaching and learning of mathematics. 3) Since the popularity of cognitive oriented mathematics learning has occurred primarily within the last decade or so, it is conceivable that a large number of secondary methematics teachers who have completed their formal professional education sequence prior to that time have chosen not to formally update their professional skills. Such persons having been trained in the behavioral or neo-behavioral approaches may not be at all familiar with the cognitive position, or after limited exposure may have rejected such an orientation.

We think university and college educators continually assume that the message (plea for change to a more cognitive type orientation) is eminently worthwhile and therefore acceptable at least at the intellectual level by the classroom teacher. The authors realize that at this point such an assumption is not fully substantiated and that more detailed and relevant information must in the future be accumulated. Given such an assumption, however, and considering that change appears slow to occur, educators at the university and classroom levels often pinpoint other factors which are responsible for "lack of progress." Frequent examples being: parents, administrators, tradition, standardized tests, school organizational patterns and school policies to mention a few. Given that teachers are more compatable ideologically with their principals than with college and university level mathematics educators, the present study suggests that secondary school teachers may be more content with the existing behaviorial orientations in the mathematics classroom than had been heretofore expected.

This study is viewed as both preliminary and exploratory in nature. As noted earlier, several of the statements made are conjectural at this point in time. It should be noted, however, that these conjectures are not inconsistent with the data and are further supported by the author's professional experiences.

Additional research is needed to shed more light on these important issues. New and refined instruments need to be developed, written participant responses should be coupled with structured interviews and various other populations and subject diciplines might also be examined. If large scale population differences persist and further evidence is found to be consistent with the data, and speculation herein, a significant factor contributing to the indolent pace with which innovation occurs in the educational system will have been identified. Such positive identification will undoubtedly prove useful in future attempts to develop a more systematic and comprehensive approach to the improvement of curricula and pedogogy in the nation's schools.